THE U. S. MISSILE DEFENSE PROGRAM, 1944-1994: A PROTRACTED REVOLUTION

DONALD R. BAUCOM
HISTORIAN
BALLISTIC MISSILE DEFENSE ORGANIZATION
703 412-2827

February 27, 1995

Accession Number: 5669

Publication Date: Feb 27, 1995

Title: US Missile Defense Program, 1944-1994: A Protracted Revolution

Personal Author: Baucom, D.R.

Corporate Author Or Publisher: BMDO, The Pentagon, Washington, DC 20301

Comments on Document: This report is essentially the same as U5463 with a few minor changes.

Descriptors, Keywords: History BMDO US Missile Defense Program Protracted Revolution Baucom

Pages: 00043

Cataloged Date: Apr 17, 1995

Document Type: HC

Number of Copies In Library: 000001

Record ID: 29967

TABLE OF CONTENTS

PREFACE

> History does not move by leaps into unrelated novelty, but rather by the selective emphasis of aspects of its own immediate past.
>
> Julian Janes, ***The Origins of Consciousness in the Breakdown of the Bicameral Mind*** (Boston: Houghton Mifflin Company, 1976), p. 228.

Five decades have passed since the first V-2 rockets fell on a defenseless London. Between the time of these first missile attacks and the Gulf War, the United States has worked steadily toward developing the means of defeating attacks by ballistic missiles. The first operational intercept of a Scud missile in January 1991 underscores the progress that has been made in this effort.

Knowledge of the milestones in this story should be a source of pride and encouragement to all members of today's missile defense community as they work to refine and increase our missile defense capabilities. It was to provide this knowledge that ***A Protracted Revolution*** was written. An awareness of how far we have come should help us to understand that our goal of making missile defenses a reality is at hand.

Donald R. Baucom
BMDO Historian
27 February 1995

Chapter 1
INTRODUCTION: FROM V-2s TO STAR WARS

On 8 September 1944, the one-ton warhead of a German V-2 ballistic missile exploded in London. The missile age had begun. Within a short time, the British had devised a scheme for knocking down a V-2 by concentrating antiaircraft artillery (AAA) fire in a segment of the sky through which the missile was about to pass. British leaders abandoned the scheme when they realized that duds in the AAA barrage would fall back on London and cause more damage than a V-2.

Postwar studies of Germany's missile program uncovered a plan to strike New York City with the world's first inter-continental ballistic missile (ICBM), which was to have been ready in 1946. This and other information inspired the Air Force to undertake two studies of missile defense interceptors within a few months after the war ended in August 1945. While the Air Force was conducting these studies, the Army was developing its Nike antiaircraft missile series; and this work became the basis of the Army's missile defense program in the 1950s.

By 1955, intelligence reports of Soviet missile developments were prompting increased Army interest in missile defenses. As a result, the Army asked the Bell Telephone Laboratory (BTL) to expand a study already underway to examine the feasibility of ballistic missile defenses. After completing 50,000 simulations on an early computer, BTL concluded that it was possible to intercept a missile with another missile, thereby settling

a dispute in the scientific-technical community about whether such a feat was possible.

Interest in missile defenses increased sharply when the Soviets launched Sputnik in October 1957. If Soviet rockets could launch a satellite into orbit, they could hurl a warhead all the way to the United States. Sputnik prompted the Defense Department to establish the Advanced Research Projects Agency (ARPA) to manage U.S. space efforts until a more permanent arrangement could be made. While many of ARPA's responsibilities for space were passed to the National Aeronautics and Space Administration when that agency was established in October 1958, DOD added other tasks to ARPA's agenda.

One of ARPA's new responsibilities was Project Defender, a program to see what could be done to defend against ballistic missiles; it proved to be a seminal effort. Based on an inventory of existing technologies and a survey of knowledge about ballistic missile phenomenologies, Defender outlined a broad array of leading-edge concepts for ballistic missile defenses, including hit-to-kill interceptors, tailored nuclear effects, and directed energy weapons. A number of these concepts would be more fully explored and developed in later U.S. missile defense programs.

About the time ARPA was established, the secretary of defense decided to merge the Air Force and Army missile defense programs and to assign the Army primary responsibility for the mission of strategic missile defense. Under Army leadership, the United States made good progress toward developing effective missile defenses. In July 1962, a Nike-Zeus missile fired out of the Kwajalein missile test facility successfully intercepted a dummy

warhead launched from Vandenberg AFB. This successful test entailed only a near-miss for the interceptor. However, since an operational Zeus missile would have carried a nuclear warhead, it would not have had to physically hit its target to destroy it. In this test, Zeus passed within two kilometers of the dummy warhead. Further advances over the next few years positioned the United States to begin fielding operational defenses.

On 18 September 1967, Secretary of Defense Robert McNamara announced that the U.S. would deploy the Sentinel missile defense system, which was designed to protect the nation from a light attack such as that which China or another "Nth" country might deliver. In 1969, President Richard Nixon halted the Sentinel deployment and reoriented this system to defend America's ICBM fields. After Congress confirmed this decision, the Army began deploying Safeguard, the name given the re-oriented missile defense system.

Safeguard was a layered defense that used two types of nuclear-tipped interceptor missiles. The long range Spartan was to intercept incoming warheads at an altitude of 70 to 100 miles. Warheads that leaked through the Spartan attacks would have been engaged 20 to 30 miles up by Sprint missiles. The ABM battle was to be controlled by a command and control system that used data from a perimeter acquisition radar that would pick up Soviet warheads coming over the pole and a missile site radar that was to guide the Spartan and Sprint missiles to the incoming warheads. While original plans called for deployment at several sites, only the Safeguard facility at Grand Forks, North Dakota, was activated.

America's first missile defense system suffered from a number of weaknesses. For one thing, its large radars were vulnerable to destruction by a nuclear attack. Additionally, the detonation of the nuclear warheads on Safeguard's own missiles would blind its radar

at a critical point in the ABM battle. The passage of the 1972 ABM Treaty was another nail in Safeguard's coffin. In conjunction with a 1974 protocol, the treaty limited the U.S. to one hundred ABM interceptors at a single site; this meant that Soviet rocket forces could easily overwhelm the Safeguard system. Given these limitations, it is not surprising that Congress ordered the Army to close down the Safeguard system in 1976, a few months after it had become operational.

When Congress terminated Safeguard, it also directed the Army to re-orient its missile defense efforts from an acquisition program to an R&D program. As a result, the Army abandoned its efforts to develop a follow-on system to take the place of Safeguard and concentrated instead on solving Safeguard's technical problems. By the early 1980s, the re-oriented Army program had advanced to the point where the Army was on the verge of revolutionizing missile defenses by being able to use non-nuclear, hit-to-kill interceptors as the basis for a new approach to missile defenses.

As the Army was pushing kinetic kill technology toward maturity, Ronald W. Reagan became president. He brought to his office a deep dislike for the doctrine of offensive nuclear deterrence that was known to its conservative critics as MAD (mutual assured destruction). Reagan's disdain for MAD had intensified in the summer of 1979 when he visited the North American Air Defense Command's (NORAD) underground command post at Cheyenne Mountain where he discussed strategic nuclear issues with General James E. Hill, the NORAD commander. Hill told Reagan that if the Soviets launched a missile attack against U.S. cities, NORAD could do nothing more than inform American leaders that the missiles were on the way.

After Reagan took office, a number of people played a role in nurturing his inclination to pursue an intensified missile defense program. Senator Malcolm Wallop (R-WY) had been working to expand U.S. missile defense efforts since 1978 and continued these efforts throughout the 1980s. Dr. Edward Teller, father of the nation's hydrogen bomb, advised Reagan that new directed energy technologies had considerable potential for missile defenses. Mr. Karl Bendetsen, a former under secretary of the Army, joined forces with retired Army general Daniel Graham to complete a study of missile defense issues. Bendetsen used this study as the basis of a January 1982 briefing he gave to Reagan, urging the president to launch a crash missile defense program. Admiral James D. Watkins, Chief of Naval Operations, played a key role in convincing the Joint Chiefs to recommend an expanded role for missile defenses in the U.S. strategic program. The assembled Chiefs made this recommendation to the president in February 1983; about six weeks later, Reagan surprised the nation by calling for the U.S. to intensify and expand its work on missile defenses.

Chapter 2
ESTABLISHING THE SDI PROGRAM

Within days of his speech, President Reagan issued formal guidance calling for the completion of two major studies that would map out a long range research and development program to see if it might be possible to develop an effective defense against ballistic missiles. The first of these was the Defense Technology Study, known as the Fletcher report after the chairman of the study group, Dr. James Fletcher, former NASA administrator. The second was a study of the strategic ramifications of a national policy that would place greater emphasis on strategic defenses; it was known as the Future Security Strategy Study.

The Fletcher report proved to be the more influential of the two, for it became the blueprint by which the SDI program was organized. At one level, it was a basic primer on ballistic missile defenses, describing the flight path of an ICBM and discussing what an effective missile defense system had to accomplish throughout the attacking missile's trajectory. At another level, it was a detailed inventory of the state of the art in eight general areas of missile defense technology: surveillance, acquisition, and tracking; directed energy weapons; conventional weapons; system concepts; battle management and command, control, and communications; survivability; lethality and threat vulnerability; and selected support systems.

Based on the information gathered in its survey of missile defense technology, the Fletcher committee devised two basic approaches for a new missile defense program. The

first was referred to as a technology constrained program. This meant that its funding level would be such that the program could proceed "as fast as technology can reasonably allow without excessive duplication and waste." The study group estimated that the cost of such a program would be $20.893 billion between FY 1984 and FY 1989. The second was a fiscally constrained program that would cost $16.93 billion over the same period. The DTS favored the first program and defined this program by establishing a set of "technology development requirements" for each of the eight general areas of missile defense technology.[1]

While the Fletcher Committee was working out its recommendations on the content of the SDI program, the under secretary of defense for research and engineering and his staff were leading efforts to work out a management structure for the SDI program. These efforts pitted those who favored a special management arrangement for SDI against those who believed that the established bureaucratic structure, with minor modifications, was equal to the management challenges posed by this program. The most important features of the management structure that emerged from this debate were instituted through the direct intervention of Secretary Weinberger, who insisted upon the establishment of a special management agency headed by a director who was selected by and reported directly to the secretary of defense. Additionally, Weinberger insisted that the director of SDIO would control the Pentagon's budget for missile defenses.

---

[1]U.S. Department of Defense, Technology Plan for the Strategic Defense Initiative (Based on Major Technical Recommendations of the Defensive Technologies Study Chaired by Dr. James C. Fletcher), February 1984. This is the first volume of the Fletcher Report; it constitutes a summary or overview volume that contains the major recommendations of Fletcher's Committee. There are a total of six other volumes that contain the "detailed technical results and recommendations" of the Fletcher study. These six volumes are: II, Surveillance, Acquisition, Tracking, and Kill Assessment; III, Directed Energy Weapon Technology; IV, Conventional Weapons; V, Battle Management, Communications, and Data Processing; VI, Systems Concepts; and VII, Soviet Countermeasures and Tactics.

On 6 January 1984, President Reagan issued a national security directive establishing the Strategic Defense Initiative (SDI), which was to be "a focused program to demonstrate the technical feasibility of enhancing deterrence and thereby reducing the risk of nuclear war through a greater reliance on defensive strategic capabilities." At the same time, the SDI program was to include the development of a plan for early deployment, in case the Soviet Union attempted to break out of the ABM Treaty as some feared they might. "The general guide for initiating this program" was to be the report developed by the Fletcher committee. The president's directive also made the Secretary of Defense responsible for the new program.[2]

Defense Secretary Weinberger issued the charter for the SDI Organization on 24 April 1984. It incorporated the provisions that he had insisted upon while the Pentagon was devising the management structure for the new program. This first charter was issued in the form of a memorandum and was not formalized until the promulgation of DOD Directive 5141.5 of 21 February 1986. The formal 1986 charter stated:

> SDIO shall manage and direct the conduct of a vigorous research program, including advanced technologies, that will provide the basis for an informed decision regarding the feasibility of eliminating the threat posed by nuclear ballistic missiles of all ranges, and of increasing the contribution of defensive systems to U.S. and allied security.

About a month before issuing SDIO's first charter, Weinberger had chosen an Air Force lieutenant general, James A. Abrahamson, to be the first director of SDIO. A native of Williston, North Dakota, Abrahamson had graduated from the Massachusetts Institute of Technology in 1955 and was commissioned through the Air Force's reserve officer

---

[2]National Security Decision Directive 119. Concern over a possible Soviet breakout was expressed in National Intelligence Estimate 11-3/8-82, Volume I: Key Judgments and Summary, 15 February 1983. See especially pp. 24-25.

training corps program. In 1961 he received a master's degree in aeronautical engineering from the University of Oklahoma. As the pilot of an F-100 fighter, he flew forty-nine combat missions in Vietnam. Following graduation from the Air Force's Research Pilots' School, he was assigned to the Manned Orbiting Laboratory program until it was cancelled in 1967. Between 1971 and 1973, he served as program director for the Air Force's Maverick missile program. After a stint as the inspector general for the Air Force Systems Command, the general became the director of the F-16 fighter program. In 1981, Abrahamson was appointed associate administrator for the space transportation system at NASA and oversaw the first ten flights of America's shuttle spacecraft.

Both the program and the organization Abrahamson established were based on the original eight areas defined in the Fletcher Report. However, these were rearranged into five broad program elements: surveillance, acquisition, tracking, and kill assessment; directed energy weapons; kinetic energy weapons; survivability, lethality, and key technologies; and systems concepts/battle management. The funding level for these program elements was to be that of the technology constrained program favored by Fletcher's committee. However, over course of the next decade, the funding level worked out between a Democratically-dominated Congress and Republican presidential administrations more nearly approximated the funding profile of the fiscally constrained program.

When SDIO's interim charter was issued, the U.S. was already spending about $1 billion per year on missile defense programs and related R&D work. Furthermore, DOD was already set to request an additional $500 million for FY 1985 before President Reagan

called for the establishment of SDI. However, the projects supported by this pre-SDIO funding were scattered throughout the military services, defense agencies, and the Department of Energy. The core of the "new" SDI program was created by drawing together a number of these projects, with the principal contributions coming from the Defense Advanced Research Projects Agency, the three military services, and the Defense Nuclear Agency.

Chapter 3
THE PHASE I ARCHITECTURE

Between the time these projects were aggregated to form the SDI program until the end of 1986, a number of important developments occurred. For one thing, the battle over the broad versus narrow interpretation of the ABM Treaty was getting under way.[3] Also, the SDI Organization was establishing the policies and procedures necessary to manage a very large R&D program. This entailed tracking the expenditures associated with a $3 billion annual budget; providing general oversight for work being completed by thousands of people in various government agencies, military headquarters, and contractor facilities scattered across the country; and directing the work of several hundred contractor personnel who provided direct support to the agency.

It was also during this two-year period that the United States completed several important experiments indicating that missile defense was technically feasible. In June 1984, a test vehicle successfully destroyed a simulated warhead in space as part of the Army's

[3]According to George P. Shultz, Turmoil and Triumph: My Years as Secretary of State (New York: Charles Scribner's Sons, 1993), pp. 578-79, the debate was under way by early October 1985 when Paul Nitze, who had helped negotiate the ABM Treaty, made known his view that Agreed Statement D allowed "broader scope for SDI testing." It was on Sunday, 6 October 1985, that National Security Adviser Robert C. McFarlane stated on "Meet the Press" that research and development work on missile defense systems and testing new systems were permitted under the ABM Treaty. Shultz quoted McFarlane as saying on this program: "I think that the President is guided by the ABM Treaty, and the terms of that treaty are . . . very explicit in Articles II, III, IV and V, plus Agreed Statement D. They make clear that on research involving new physical concepts, that that activity, as well as testing, as well development, indeed, are approved and authorized by the treaty. Only deployment is foreclosed, except in accordance with Articles XIII and XIV. So our program is compatible with the treaty, and will remain so."

Homing Overlay Experiment.[4] This experiment was the culmination of years of Army work and constituted proof that principles behind the hit-to-kill interceptor were sound. Additionally, there were two successful tests in an Army program called flexible lightweight agile guided experiment (FLAGE). One of these entailed the destruction of a stationary target in April 1986. In the second test that took place in June 1986, a FLAGE missile intercepted a target that was travelling at over 2100 miles per hour.[5] Finally, in September 1986, SDIO achieved a major success with its Delta 180 experiment, which involved making "critical space observations" and achieving a "hit-to-kill" intercept of a mock warhead in space.

In addition to the experimental work that SDIO was doing between 1984 and 1986, the organization was also developing a preliminary missile defense architecture. This architecture was a conceptual structure that could be used to establish tentative performance criteria for missile defense components such as sensors and interceptors. Once these components were developed, the architecture would become the blueprint for integrating them into a coherent missile defense system.

By the end of 1986, the achievements of the U.S. missile defense program had

---

[4]In the summer of 1993, HOE, as this program was known, became the center of a controversy when the New York Times charged that the test had been rigged to deceive the Soviet Union and had in the process also deceived the U.S. Congress into providing more support for SDI than it otherwise would have. This charge was based on the "testimony" of four anonymous officials. Still, the charges leveled by the Times were picked up by newspapers across the country and by opponents of DOD's missile defense program and used to pillory the program for several weeks. An investigation conducted under direction from Secretary of Defense Les Aspin concluded that although a deception program was indeed in place, the test had not been rigged to distort the results the Army achieved in the HOE test. These findings were later confirmed by an independent review completed by the Government Accounting Office (see: United States General Accounting Office, Ballistic Missile Defense: Records Indicate Deception Program Did Not Affect 1984 Test Results, Report to the Chairman (Senator David H. Pryor), Subcommittee on Federal Services, Post Office and Civil Service, Committee on Governmental Affairs, U.S. Senate, July 1994, GAO/NSIAD-94-219.

[5]Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs), "Experiment Flight Vehicle Destroys Moving Target During Experiment," News Release 325-86, 1 July 1986.

convinced the secretary of defense and President Reagan that the SDI program had progressed sufficiently to warrant taking the first step toward the deployment of missile defenses: they directed SDIO to submit a missile defense system concept for review by the Defense Acquisition Board (DAB). This concept, known as the Strategic Defense System (SDS) Phase I Architecture, would eventually have to satisfy the requirements for missile defenses that the Joint Chiefs of Staff issued on 23 June 1987.

During June and July 1987, the DAB reviewed the Phase I Architecture and recommended that SDIO move this concept forward into the concept exploration and definition phase of the acquisition process (see Figure 1 for a diagram of the major phases and milestones of this process). Additionally, the DAB concluded that the six major elements that comprised the architecture should be authorized to proceed into the demonstration and validation phase. These six original elements were the boost surveillance and tracking system, the space-based interceptor (SBI), the battle management/command and control and communications system, the space-based surveillance and tracking system, the ground-based surveillance and tracking system, and the exoatmospheric reentry vehicle interceptor system. When combined in accordance with the architectural concept, these elements would form a multi-tiered defense that could attack Soviet missiles and warheads throughout their flight. On 18 September, Secretary Weinberger approved the DAB's recommendations.[6]

The original Phase I Architecture had two major deficiencies: it was costly and its

---

[6]Department of Defense, Office of Assistant Secretary of Defense (Public Affairs), News Release No. 483-87, "SDI Gains Milestone I Approval," 18 September 1987.

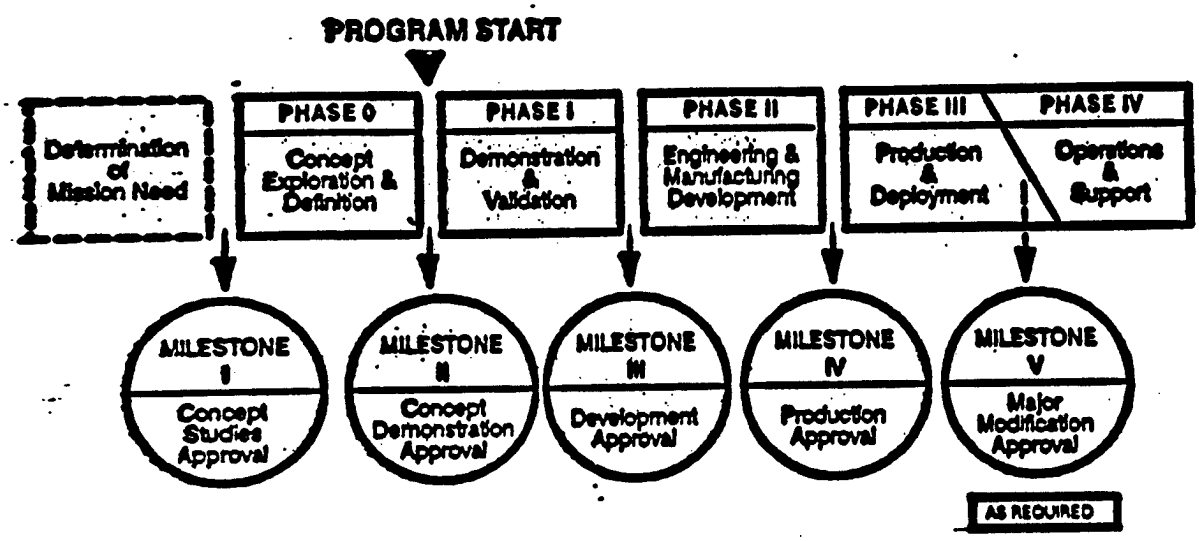

Figure 1 Acquisition Milestones and Phases

(From The Analytic Sciences Corporation, Defense Acquisition System, 24 July 1991)

space-based elements were vulnerable to attack by Soviet anti-satellite systems (ASATs). The focus of vulnerability was the space-based interceptor, which was to be in essence a garage housing ten interceptor missiles. If a single Soviet ASAT could destroy an SBI, it would achieve a highly advantageous kill ratio of ten to one. A possible answer to these problems had begun to emerge several months before the 1987 DAB review.

In November 1986, Edward Teller and his protege Lowell H. Wood, Jr., a scientist at Lawrence Livermore National Laboratory, Dr. Lowell L. Wood, Jr., had breakfast in Cambridge, Massachusetts, with Dr. Gregory H. Canavan of the Los Alamos National Laboratory. In the course of their conversation at table, Canavan suggested that the problems of vulnerability and cost that were associated with space-based systems might be overcome by developing small, autonomous interceptors whose sensors and powerful miniature computers would allow them to intercept Soviet warheads with little or no support from other satellites. Wood took these ideas and developed them into a concept for singlet interceptors. Because of the capacity of their computers and their small size, these interceptors became known as Brilliant Pebbles (BP).[7]

Wood briefed General Abrahamson on a precursor of BP on 24 February 1987. This was a "stand-alone, 'un-garaged' interceptor" that weighed 10 to 25 kilograms. This small size, Wood thought, would allow the interceptors to be placed in low earth orbit by a "laser

[7]Ralph Kinney Bennett, "Brilliant Pebbles: Amazing New Missile Killer," Reader's Digest, September 1989, pp. 128-33; William J. Broad, Teller's War (New York: Simon & Schuster, 1992), pp. 251-53. Bennett's account does not include Teller in the November 1986 breakfast episode. Broad's account, based at least in part on Bennett's earlier article, adds Teller to this meeting. This addition is apparently based on Broad's own 5 December 1989 interview with Canavan (see note 16, p. 319).

propulsion system."[8] In October, the BP concept itself was briefed to Abrahamson.[9] By the time he retired from the Air Force at the end of January 1989, Abrahamson had become a strong supporter of the Brilliant Pebbles concept. In his final report on the SDI program General Abrahamson stated: "This concept should be tested within the next two years and, if aggressively pursued, could be ready for initial deployment within 5 years."[10] It would fall to Abrahamson's successor to oversee the integration of BP into the SDS Architecture.

Like his predecessor, the second SDIO Director, George L. Monahan, Jr., was an Air Force lieutenant general. Born in Minneapolis, Minnesota, in 1933, he graduated from West Point in 1955; and later earned a master's degree in electrical engineering from the University of New Hampshire. A fighter pilot with over 3,500 flying hours, he flew 122 combat missions in Vietnam, including 75 missions over North Vietnam. As a senior officer he served in several important posts, including system program director for the F-16 multinational fighter program, vice commander of the Air Force Systems Command, and principal deputy assistant secretary of the Air Force for acquisition.[11]

During Monahan's first year as SDIO director, analyses indicated that Brilliant

---

[8]Lowell H. Wood, "Operational Strategic Defense in the '80s: Very Near-Term Launch Capability for a Nitze-Satisfying SBKKV System," Presentation to Lt. Gen. James A. Abrahamson, in the Pentagon (Room 2E252), 24 February 1987.

[9]Bennett, "Brilliant Pebbles," p. 131-32, states that Wood and Teller first briefed Abrahamson on Brilliant Pebbles in the general's Pentagon office in October 1987. At this meeting, Abrahamson committed himself to visiting Lawrence Livermore National Laboratory to receive a further briefing on the new interceptor concept. Abrahamson supposedly fulfilled this commitment the day before Thanksgiving in 1987.

[10]James A. Abrahamson, Memorandum for Deputy Secretary of Defense, Subject: "'End of Tour Report,'–Information Memorandum," 9 February 1989, Attachment 1, "Lt General Abrahamson's Recommendations: SDI Breakthrough Architectures," pp. 1-1 through 1-3.

[11]Members of the SDI Organization were stunned and saddened when the general died suddenly of a heart attack at the age of 59, less than three years after his retirement. For obituaries, see Washington Post, 6 February 1993, p. B5; and New York Times, 6 February 1993, p. 10.

Pebbles was indeed the answer to the cost and vulnerability problems of the Phase I system. Small and spread throughout space, the Pebbles would be difficult targets for Soviet ASATs. Even if an ASAT struck a Pebble, it would destroy only a single interceptor, a simple one-for-one exchange ratio. Since the Pebbles were self-contained, they did not require the support of the large, vulnerable, and expensive garage that was a hallmark of the SBI. Other reductions in cost were to be achieved by mass producing the Pebbles.

As 1989 ended, the Brilliant Pebbles concept was rapidly becoming the central element in the SDS Phase I architecture. In the process, it produced other major changes in the architecture beyond displacing the SBI garage. Principal among these was the elimination of the boost surveillance and tracking system. BP also raised questions about the requirement for a space-based surveillance and tracking system.

Even as these changes in the architecture were taking place, a remarkable transformation was underway in the strategic relationship between the United States and the Soviet Union. In 1989, the Soviet hegemony over eastern Europe collapsed. Two years later, Mikhail Gorbachev would be overthrown in a coup attempt that brought Boris Yeltsin to the fore and hastened the disintegration of the Soviet empire. The threat of a massive Soviet missile attack that had been the mainspring of the SDI program evaporated almost overnight. Gone was the requirement for a layered missile defense system that could destroy thousands of nuclear warheads in a matter of minutes.

Chapter 4
REFOCUSING FOR THE POST-COLD WAR WORLD: THE RISE OF THEATER MISSILE DEFENSES

From the perspective of missile defenses, one of the earliest and most important pronouncements on the world's changing strategic situation came from Senator Sam Nunn. In January 1988, while addressing the Arms Control Association, the senator from Georgia noted that "the advent of Gorbachev, glasnost and perestroika" had "undeniably improved the overall climate for the conduct of superpower relations." Nunn further stated that he could "envision certain defensive deployments which could be in the interest of both our nation and the Soviet Union. If carefully redirected, our research efforts could produce options for limited deployments to deal with the frightening possibility of an accidental or unauthorized missile launch." The Senator Nunn also suggested that this system might be called the "'Accidental Launch Protection System'" or "'ALPS'".[12]

Two years later, a Bush administration review of America's security requirements spawned a similar assessment of the changing world situation and the role that missile defenses might play as the Cold War ended. This assessment appeared in an independent review of the SDI program completed in March 1990; it warned that, as a result of tensions in the Soviet Union and the proliferation of missile technology, the likelihood of accidental and unauthorized missile attacks would increase during the coming years. Also increasing

---

[12]Sam Nunn, "Arms Control in the Last Year of the Reagan Administration," Speech before the Arms Control Association, 19 January 1988, pp. 2, 10-11.

was the probability that missiles would be used in regional conflicts where U.S. forces might be involved. Therefore, the U.S. missile defense program should begin to focus on providing protection against limited missile attacks, including those that might be made against deployed U.S. forces.[13]

The author of this study was Ambassador Henry F. Cooper. A native of Augusta, Georgia, he received his BS and MS degrees from Clemson University and his PhD in mechanical engineering from New York University. He served as an Air Force officer for a brief period beginning in 1964 and worked in a number of laboratories. For eight years after leaving the Air Force, he was a member of the senior technical staff and a program manager at R&D Associates. In 1980, he became assistant secretary of the Air Force with programmatic responsibility for all Air Force strategic and space systems. He returned to R&D Associates in 1982 where he served as Deputy Director of the Nuclear Effects Division until 1983. Between November 1983 and March 1985, he was assistant director of the Arms Control and Disarmament Agency. He then became first the deputy U.S. negotiator and then chief negotiator at the Defense and Space Talks in Geneva. In December 1989, he became senior vice president for strategic planning at Jaycor. Cooper became the third director of SDIO after General Monahan retired at the end of June 1990. Confirmation of the views Cooper had expressed in his independent review was quick in coming.

In August 1990, Iraq invaded Kuwait. The war triggered by this invasion had two major effects on the SDI program, one transitory, the other more enduring. First, vivid

---

[13]Henry F. Cooper, SDI Independent Review, 15 March 1990, pp. 1, 4-5, 27-29, 62-65, 73-75, 77-79.

pictures of ballistic missiles falling on cities in the Middle East prompted Congress to order the Defense Department to push toward deployment of limited national missile defenses. The fragile consensus that supported this deployment lasted little more than two years after the war. The second effect, an increased emphasis on theater missile defenses, led to a major transformation in the U.S. missile defense program.

As tension built in the Middle East there was growing concern that U.S. forces would come under attack by Iraqi Scud missiles. This situation was partly responsible for Congress directing the Defense Department to establish a centrally managed research and development program for Theater Missile Defense, leaving it to the secretary of defense to determine the way in which the new TMD effort would be managed. In November 1990, the deputy secretary of defense assigned this responsibility to SDIO.[14]

The tension that had been growing since the fall of Kuwait broke on 17 January 1991. In the deep darkness of early morning, allied air power was unleashed on Iraqi targets.[15] The following day, the first operational engagement between defensive and offensive missiles occurred when a Patriot battery fired on a Scud missile that was attacking an air base in Saudi Arabia. A reporter for the *Los Angeles Times* declared that the "age of 'Star Wars'" had begun.[16]

---

[14]On 29 October 1990, Ambassador Henry Cooper proposed to the secretary of defense and the deputy secretary of defense that responsibility for the centrally managed tactical ballistic missile defense research and development program be assigned to SDIO. On 9 November 1990 Deputy Secretary of Defense Donald J. Atwood, Jr., indicated his approval of Cooper's proposal by initialling the ambassador's memorandum. See Henry F. Cooper, Memorandum for the Secretary of Defense through the Deputy Secretary of Defense, Subject: "Tactical Ballistic Missile Defense--Action Memorandum," 29 October 1990. Atwood's initials appear in the upper right hand corner of the document on file in the BMDO History Office.

[15]Thomas A. Keaney and Eliot A. Cohen, Gulf War Air Power Survey: Summary Report (Washington, D.C.: U.S. Government Printing Office, 1993), pp. 11-12.

[16]Melissa Healy, "High-Tech Missile Hits Bull's-Eye," *Los Angeles Times*, 22 January 1991, p. 1.

Within two weeks of this first Patriot-Scud engagement, President Bush called for the United States to refocus its ballistic missile defense program.[17] The new focus was to be an architecture known as GPALS or Global Protection Against Limited Strikes. Theater missile defense constituted a major component of the new architecture, which would integrate ground-based theater defenses, ground-based national defenses, and an overarching space-based system. This combination was designed to defend the entire globe against accidental, unauthorized, and limited theater attacks.

As the Gulf War continued, Americans were confronted nightly with television images of civilians and soldiers running for cover as Scud missiles streaked toward their targets. Senators Sam Nunn (D-GA) and John Warner (R-VA) even experienced a Scud attack first hand while they were traveling in Israel. In March, both men reflected on the experience during discussions on the floor of the Senate. Nunn described the experience in these words:

> The Senator from Virginia and I were together when an attack came, as he related earlier in the day. We were in the Defense Ministry when the Scud missile was launched, and we had about a 5-minute warning in the middle of a conversation with the Israeli Defense Minister. We heard the Patriot go up. We heard the intercept.
>
> We found the next day that the Defense Ministry was indeed the target. So we ourselves had some pretty interesting experiences there. We understand very well what the citizens of Israel have gone through.
>
> We have great feeling for that, and also what the citizens in some of the Saudi Arabian cities have gone through.[18]

---

[17] George H. W. Bush, "State of the Union Address," 29 January 1991. The president's words were: "Looking forward, I have directed that the SDI program be refocused on providing protection from limited ballistic missile strikes--whatever their sources. Let us pursue an SDI program that can deal with any future threat to the United States, to our forces overseas, and to our friends and allies." President Bush, along with key members of his cabinet and top security advisers, received their first briefing on GPALS on 3 January 1991.

[18] Congressional Record, 13 March 1991. Nunn's remarks are on p. S3178. Warner had earlier stated that "all of us had the full opportunity, through extraordinary real-time reporting by our media--indeed, media from all over the world--to see the consequences of the Scud attacks and the threats associated therewith." (p. S3177)

These images were still fresh in the minds of congressmen when they passed the Missile Defense Act (MDA) in November 1991. The MDA stated that the secretary of defense "shall aggressively pursue the development for deployment" of limited national missile defenses by 1996 or as soon as was technically feasible and required the development and deployment of advanced theater missile systems by the mid-1990s. These limited defenses were to be compliant with the ABM Treaty. At the same time, the MDA called for the president to undertake talks with the Soviets aimed at achieving an agreement that would permit a wider deployment.[19]

Toward the end of 1992, with the threat of a massive attack by Soviet ICBMs now clearly diminished, Congress amended the missile defense act of the previous year to push the SDI program toward further emphasis on theater missile defenses. The FY 1993 Defense Authorization Act amended the Missile Defense Act to eliminate the requirement for fielding a limited national defense by 1996 and added language to the law that placed greater emphasis on compliance with the ABM Treaty of 1972. Furthermore, the 1993 act relaxed the goals for theater missile defense programs. The Defense Department was still required to develop advanced theater defense systems for deployment; however, the goal of fielding these systems by the mid-1990s was deleted. Finally, the law of 1993 directed the Pentagon to establish the Theater Missile Defense Initiative (TMDI), which was to be co-

---

[19]U.S. Congress, House of Representatives, 102d Congress, 1st Session, Report 102-311, "National Defense Authorization Act for Fiscal Years 1992 and 1993, Conference Report to Accompany H.R. 2100, 13 November 1991, pp. 33-34. The wording of the bill says that the secretary of defense "shall aggressively pursue the development for deployment by the earliest date allowed by the availability of appropriate technology or by fiscal year 1996 a cost-effective, operationally-effective , and ABM Treaty-compliant anti-ballistic missile system at a single site as the initial toward deployment of an anti-ballistic missile system . . . designed to protect the United States against limited ballistic missile threats, including accidental or unauthorized launches or Third World attacks." He was also to "aggressively pursue the development of advanced theater missile defense systems, with the objective of downselecting [reducing the number of systems being pursued] and deploying such systems by the mid-1990s."

equal with the Strategic Defense Initiative. Congress further stipulated that all theater missile defense programs, including those managed by SDIO, were to be consolidated under the theater initiative. SDIO assumed responsibility for the TMDI.[20]

These changes in the SDI program brought with them a major transformation in the SDI Organization itself. A March 1991 reorganization established a deputy director for theater missile defense. The objective here was to elevate the management of theater missile defenses to the same organizational level as the management of the strategic or national defense program.[21] Additionally, the order to deploy national and theater defenses that was contained in the Missile Defense Act of 1991, prompted Ambassador Cooper to negotiate a memorandum of agreement with the secretaries of the military services in the spring of 1992. This agreement established a general manager function within SDIO and created a program executive officer (PEO) in each of the military services. Together, the general manager and PEOs had overall responsibility for the acquisition and fielding of all U.S. missile defense systems.[22]

In addition to major organizational changes, there was a major shift in funding priorities. The FY 1990 budget for SDIO's theater missile defense office was $125 million.

---

[20]Ambassador Cooper recommended to Secretary of Defense Richard Cheney that SDIO be assigned responsibility for the TMDI. Cheney failed to make a formal decision on this matter before the Bush administration left office. However, SDIO's *Report to Congress*, January 1993, p. 1-13, stated: "The Secretary of Defense has assigned the TMDI to SDIO to ensure the benefits of complementary technology development and to preclude duplication of effort." This report was approved by the OSD staff and forwarded to Congress under a letter from Secretary Cheney.

[21]Henry F. Cooper, Memorandum for the Secretary of Defense, Through the Deputy Secretary of Defense, Subject: "SDIO Organizational Realignment–Information Memorandum," 18 March 1991.

[22]Henry F. Cooper, et. al., Memorandum of Agreement among the Strategic Defense Initiative Organization and Department of the Army and Department of the Navy and Department of the Air Force, 1 May 1992 (the date assigned here is the date the last party to the agreement, the secretary of the Army, signed the agreement).

Four years later, Congress voted to spend almost $1.5 billion on theater missile defenses. These organizational and funding changes show that a major transformation in the SDI program was well along by the end of the Bush presidency.

Chapter 5
BMD UNDER THE CLINTON ADMINISTRATION

William Jefferson Clinton became the forty-second president of the United States on 20 January 1993. By the time Clinton's first year in office was over, the trend in America's missile defense program toward more emphasis on theater missile defenses was fully consummated and theater missile defense was clearly the focus of the U.S. missile defense program.

As Clinton was about to take office, Les Aspin, secretary of defense designee, gave one of the first official indications of the new administration's thinking on missile defenses. During his confirmation hearings, he stated that the top priority for the missile defense program would be theater defenses. Full details on what this priority entailed would have to await the completion of a "comprehensive review" of U.S. defense requirements for the post-Cold War era. Begun in March and known as the Bottom-Up Review (BUR), this study was expected to provide the framework for a "multi-year plan for America's future security,"[23] including a new five-year program for missile defenses.

On 13 May 1993, while the BUR was still in progress, Secretary Aspin announced that the Strategic Defense Initiative Organization was being renamed the Ballistic Missile Defense Organization. In explaining the name change, Aspin stated that the change "signals

---

[23]U.S. Department of Defense, Report on the Bottom-Up Review, October 1993, p. 4. The results of the review were actually briefed to the public on 1 September 1993.

the end of the Star Wars era" that coincided with the last years of the Cold War.[24] The renaming of SDIO and the secretary's comments clearly indicated that the transformation of the U.S. missile defense program that had been underway since 1990 would continue under the Clinton administration.

By the time SDIO was renamed, Aspin had decided to appoint Major General Malcolm R. O'Neill the first director of BMDO. A native of Chicago, O'Neill was graduated from DePaul University with a bachelor of science degree in physics and was commissioned in 1962 through the Army's Reserve Office Training Corps program. He served two tours in Vietnam where he was twice wounded and received the Bronze Star Medal for gallantry. The general earned his PhD in physics from Rice University and served in a number of important R&D posts, including an assignment in SDIO between 1985 and 1987 and a tour as commanding general, U.S. Army Laboratory Command. In 1990, he had returned to SDIO as the agency's deputy director and became acting director when Ambassador Cooper resigned in January 1993. Aspin's selection of O'Neill could not be announced until the decision was properly coordinated, and it was not until November that the Senate approved O'Neill's appointment. The Senate approval carried with it a promotion to the rank of lieutenant general.

Four months after proclaiming the end of the "Star Wars era," Secretary Aspin released the results of the Bottom-Up Review, which spelled out a new five-year missile defense program. This program reduced funding from the $39 billion sought under the last

---

[24] Office of the Secretary of Defense, Public Affairs, Memorandum for Correspondents, No. 159-M, 13 May 1993. This memorandum states: "From now on, SDIO will be the Ballistic Missile Defense Organization. This signals the end of the Star Wars era . . . "

budget of the Bush administration to $18 billion. Under the revised plan, $12 billion would be spent on theater missile defenses, $3 billion on national missile defense (NMD) programs, and $3 billion on follow-on technology. The primary goal of this five-year program was to field effective theater missile defense systems in the shortest possible time, while providing a basis for a speedy decision to deploy national defenses should a serious threat to the U.S. homeland suddenly materialize.[25] Shortly, after the announcement of the BUR results, DOD's top leaders decided to reduce the five year funding for the BMD program by one billion dollars with most of the cuts coming in the area of theater missile defense.

The core of the resulting TMD program was comprised of three systems that were already under development when the BUR began. The first of these was to make further improvements to the Patriot system that had been used against Scud missiles in the Gulf War. Patriot's radar was to be upgraded and a better missile added to the system. This missile was to be either a Patriot interceptor improved by installing a multi-mode seeker or a new hit-to-kill missile known as the Extended Range Interceptor (ERINT). The second core program entailed modification of the Navy's Aegis air defense system so it could intercept theater ballistic missiles. The third program was known as the Theater High Altitude Air Defense (THAAD) system. It was designed to have the greater capabilities required to destroy longer range theater missiles with their higher velocities and to protect greater areas of "friendly" territory. Finally, DOD planned to start one additional theater system in fiscal year 1998; the three principal competitors for this "new-start" program were

---

[25] Office of the Secretary of Defense, Report of the Bottom-Up Review, October 1993, pp. 41-48.

the Army's Corp SAM, a boost phase interceptor concept, and a further expansion of capabilities for sea-based missile defenses.[26]

With regard to NMD, the BUR called for BMDO to pursue a technology readiness program to prepare for the time when it might be necessary to quickly deploy defenses for the U.S. homeland. In Laying out its program, BMDO assumed that post-Cold War planning would be marked by high uncertainty, for it was not clear when a threat to the US homeland might emerge and what its exact nature might be. Therefore, BMDO developed a general investment strategy that focused on the most difficult technical problems presented by the national defense mission. This strategy was broken into three periods: 1995-1997, 1998-2000, 2001-2003. Research and development investments in each of these periods was designed to assure that the U.S. could begin development and deployment of a defensive system with sufficient capability to meet whatever threat might emerge. The longer the time before deployment, the more capable would be the system deployed.[27]

A third component of the Clinton administration's BMD program was a technology program was to focus on those projects that promised to enhance TMD systems being developed for deployment and to contribute to the NMD technology readiness program.

---

[26] Report of the Bottom-Up Review, pp. 46-47. The BUR decision on TMD was described in these words on p. 47:

> "On TMD, we have decided to pursue Option 2–A TMD program that includes PAC-3, the Standard Missile Block IVA, THAAD, and the Sea-Based Upper Tier system, all funded as major acquisitions in FY 1995-99. We will also examine the feasibility of ascent/boost-phase intercept capabilities. Development of PAC-3 will allow major work on Corps SAM to be deferred until FY 1998."

The TMD program plan described in the text above was worked out by BMDO, in conjunction with the OSD staff and the military services, to implement the directions of the BUR report. For more information on this version of the BUR plan for TMD, see U.S. Department of Defense, Ballistic Missile Defense Organization, 1994 Report to Congress on Ballistic Missile Defense, July 1994, Chapter 2. See especially, pp. 2-16, 2-32.

[27] Once again, the description of the NMD program provided is the plan actually worked out in the Pentagon to implement the instructions contained in the BUR report. For the instructions of the BUR, see Report of the Bottom Up Review, pp. 47-48. Compare these pages with BMDO's 1994 Report to Congress, pp. 1-3 - 1-5 and Chapter 3. See especially, pp. 3-1 - 3-3 and 3-8.

Projects in all of the major areas of missile defense research and development--interceptors, sensors, and directed energy weapons--were to be pursued.[28]

The TMD portion of the BUR program provided the framework within which a highly significant milestone was achieved. Throughout its existence, SDIO had continuously pushed the development of hit-to-kill interceptors. The wisdom of these efforts was confirmed on 11 February 1994 when the Army System Acquisition Review Council (ASARC) announced its decision in the missile competition that was part of the Patriot PAC-3 program. The ASARC selected the Extended Range Interceptor (ERINT), a hit-to-kill interceptor, over the Patriot multi-mode missile that was to use an explosive warhead, to be the PAC-3 missile. An important factor in this decision had been a successful test flight of ERINT on 30 November 1993. Four days after the ASARC's decision, the ERINT completed a second successful intercept test.[29] This decision to introduce a new missile defense technology into an operational system was the culmination of a long effort that can be traced back to Army programs of the early 1960s.[30]

More recently, the Defense Department decided to reduce funding for the BMDO

---

[28]This third portion of the BMD program was not clearly delineated in the Report of the Bottom-Up Review. The BUR called for a technology program of about $3 billion over the course of the FYDP. This value is arrived at by adding $12 billion (the TMD program) and $3 billion (for NMD) and subtracting the sum ($15 billion) from the total five-year BMD program ($18 billion). See pp. 47-48. For a clear discussion of the funds breakout under the BUR, see 1994 Report to Congress, p. 1-3. For a discussion of the technology program as it was actually worked out in compliance with the BUR instructions, see 1994 Report to Congress, pp. 1-5 - 1-6 and Chapter 4.

[29]David Hughes, "Army Selects ERINT Pending Pentagon Review," Aviation Week, 21 February 1994, p. 93; U.S. Army Program Executive Office, Missile Defense, Public Affairs Office, Redstone Arsenal, AL., "ERINT Intercept--Memorandum for Correspondents," n.d., provided 15 February 1994 by BMDO's Major Christine Queen.

[30]V. S. Kupelian, Memorandum for the Record, Subject: "Genesis of Miniature Homing Intercept [Technology] (HIT)," 28 January 1986. Attached to Kupelian's memorandum are two things. One is an extract from Project Defender AMRAC Proceedings, Volume VIII, Part I, Meeting of 15, 16, and 17 April 1963, Monterey, California. These proceedings were published by the Institute of Science and Technology of The University of Michigan, under contract SD-91 with the Advanced Research Projects Agency. The second item is an extract from J. D. Billingsley, D. T. Cottingham, B. G. Goad, and P. M. Kenner of LTV Aerospace Corporation, "An Unconventional Interceptor," Journal of Defense Research, Series A: Strategic Warfare, Vol. 2A, Number 2, Summer 1970 [published 10 June 1970], pp.305-325.

program by another ten percent. During the year following the publication of the Bottom-Up Review report, Congress indicated that it would not support the funding levels advocated in the report. As a result, Deputy Secretary of Defense John Deutch decided in August 1994 to reduce the five year program for missile defenses by another $1.8 billion to bring the BMD budget for FY 1996-2001 into line with what Congress was likely to fund.[31]

[31] John M. Deutch, Memorandum for Members of the Defense Resources Board, et. al., Subject: "Program Decision Memorandum I," 16 August 1994, pp. 4-6; "BMDO Cuts Driven by Congressional Marks, Deutch Says," Aerospace Daily, 24 August 1994, p. 300.

CONCLUSION

A PROTRACTED REVOLUTION

The missile age began in September 1944 when the first German V-2 fell on a London that lay helpless before the onslaught of this revolutionary weapon. Massive expenditures on offensive weapons over the next four decades assured that the ballistic missile would retain its advantage over defenses. Furthermore, arms control measures initiated in the early 1970s established offensive nuclear deterrence as the dominant paradigm in U.S. strategic thought, while constantly characterizing missile defenses as a destabilizing and therefore dangerous technology.

While spending billions each year on offensive systems, the United States also invested modestly and somewhat erratically in missile defense programs. This investment gradually built up a technology base that positioned the United States to challenge the superiority of the ballistic missile as the Cold War was ending. Between 1946 and 1955, U.S. scientists and engineers had first verified analytically that a missile could intercept another missile. Next, during the period from 1955 to 1962, the Defense Department demonstrated that even with the relatively inaccurate guidance systems of this period, a nuclear-tipped interceptor could destroy an attacking ICBM warhead. Using this technology base, the United States deployed a missile defense system, Safeguard, that became operation in late 1975. After Safeguard was closed in early 1976, the U.S. Army pushed the development of hit-to-kill or kinetic-kill technology that promised to provide the basis for

eliminating the shortcomings of Safeguard. The Army's Homing Overlay Experiment in June 1984 confirmed the feasibility of this new technology just as the Defense Department was implementing President Reagan's decision to substantially increase the U.S. investment in missile defense R&D. Building on the foundation laid by the Army, the DOD's missile defense agency used this increased investment over the next ten years to create a state-of-the-art technology base that could support the development of advanced missile defense systems based on the hit-to-kill principle.

One clear indication of the maturing of this technology base was the performance of the Patriot missile during Desert Storm. While Patriot's performance was far from flawless, it served notice that missile defenses could have a profound strategic, if not tactical, impact on military operations; and this impact was achieved with technologies of the 1960s and 1970s. In the case of the ERINT missile that will soon become operational in improved Patriot batteries, the United States will be fielding systems based on the latest and most mature missile defense technology in the world. Moreover, the maturing of this technology base has coincided with the end of the Cold War, which undermined the doctrine of offensive nuclear deterrence, thereby releasing the tension in the main spring that had been driving the offensive arms competition between the U.S. and the Soviet Union. The coincidence of these two conditions might well signal the beginning of a new strategic era in which the defense again achieves dominance over the offense.

MISSILE DEFENSE MILESTONES

1944-1994

8 Sep 44 The Missile Age began when the first German V-2 missile struck London.

1944/45 The Allies developed a plan to use timed anti-aircraft artillery barrages to defend London against incoming V-2 missiles. The plan was never implemented because of the damage that would have been caused when unexploded artillery shells fell back on the city.

1945/46 At the end of World War II, U.S. leaders learned of Nazi plans for an ICBM that would have been aimed at New York City had the war continued into 1946.

4 Jul 45 A delegation of American officers, which went to Europe to investigate the use of ballistic missiles during World War II, recommended that the U.S. undertake a research and development program to develop defenses against these new weapons.

Dec 45 A report by the Scientific Advisory Group of the U.S. Army Air Forces (forerunner of the U.S. Air Force) discussed the use of missiles and a form of energy beam to defend against missile attacks.

4 Mar 46 The Army Air Forces, precursor of the U.S. Air Force, initiated two long term studies, Projects Thumper and Wizard, that were to explore the feasibility of developing interceptor missiles that could destroy missiles moving as fast as 4,000 miles per hour at an altitude as high as 500,000 feet.

29 May 46 The Stilwell Board Report, which had been convened in November 1945 to determine what equipment U.S. ground forces would require following World War II, recommended the development of defenses against ballistic missiles. The report stated:

> *"Guided missiles, winged or nonwinged, traveling at extreme altitudes and at velocities in excess of supersonic speed, are inevitable. Intercontinental ranges of over 3,000 miles and pay load[s] sufficient to carry atomic explosive[s] are to be expected. Remotely controlled, and equipped with homing devices designed to be attracted to sound, metal, or heat, such missiles would be incapable of interception with any existing equipment such as fighter aircraft and antiaircraft fire. Guided interceptor missiles, dispatched in accordance with electronically computed data obtained from radar detection stations, will be required."*

1955 Using an analog computer, Bell Telephone Laboratories completed 50,000 simulated intercepts of ballistic missile targets. These simulations indicated that it was possible to hit a missile with another missile. Up to this point, a number of scientists said that it was impossible to intercept missiles because of their high speed. This, they said, would be like "hitting a bullet with another bullet."

16 Jan 58 Secretary of Defense Neil H. McElroy assigned primary responsibility for the ballistic missile defense mission to the U.S. Army, ordering the Air Force to scale back its Project Wizard and make the radar and command and control equipment from this project compatible with the Army's Nike Zeus ballistic missile defense system.

19 Jul 62 During a test over the Pacific Ocean, a Nike Zeus missile fired from the Army's Kwajalein test facility intercepted a dummy warhead from an Atlas ICBM. Although the Zeus only came within two kilometers of the warhead, this was close enough so that the nuclear warhead of a fully operational Zeus would have destroyed the ICBM warhead.

22 Dec 62 A Zeus missile came within 200 meters of a reentry vehicle during a simulated intercept over the Pacific Ocean.

10 Nov 66 Secretary of Defense Robert S. McNamara informed the American people that the Soviets were deploying their Galosh ballistic missile defense system.

18 Sep 67 Secretary of Defense Robert S. McNamara announced President Lyndon Johnson's decision to deploy the Sentinel ballistic missile defense system. This was to be a two-tiered defensive system that employed two interceptors: the Spartan and the Sprint, both of which were nuclear-tipped. The Spartan intercepted warheads and decoys outside the atmosphere. The Sprint intercepted warheads within the atmosphere where air resistance would strip away decoys and make it easier to find the attacking warheads. The system itself was designed to protect the U.S. from the so-called "Nth country threat," an attack by unsophisticated ICBMs such as those the People's Republic of China was building.

6 Feb 69 Secretary of Defense Melvin Laird halted the deployment of the Sentinel system pending the completion of a review of U.S. strategic programs by the new administration of President Richard Nixon.

14 Mar 69 President Richard Nixon announced his decision to deploy a missile defense system designed essentially to protect U.S. ICBM fields from attack by Soviet missiles. This system retained the same missiles that were to be deployed as part of the Johnson administration's Sentinel system. The re-oriented missile defense system was renamed Safeguard. The overall plan for Safeguard included the option to expand the system so that it could become a population defense against the "Nth country threat."

26 May 72 U.S. President Richard Nixon and Soviet General Secretary Leonid Brezhnev signed the SALT I agreements which include the ABM Treaty. This treaty limited the Soviets and the U.S. to the deployment of two ABM sites, each having 100 interceptors. One site was to guard an ICBM field, the other would protect the national command authorities at each nation's capital city. A 1974 protocol reduced the number of permitted sites to one.

1976 In view of technical limitations and the restrictions on missile defenses contained in the ABM Treaty, Congress ordered the Army to close down the Safeguard system, scarcely four months after it had become operational. The Soviets continued to maintain their own ABM system near Moscow. At the same time, Congress directed the Army to re-orient its missile defense program from one designed to produce a follow-on system to Safeguard to a program of R&D that was to serve as a hedge against a possible Soviet breakout from the ABM Treaty.

There were at least two major problems with the Safeguard system. First, its large phased array radars were vulnerable to destruction by Soviet missiles. Destruction of these radar systems would blind the defensive system. Additionally, when the nuclear warheads on defending Spartan and Sprint missiles were detonated, these explosions themselves would also blind the radar systems.

1976-1984 The U.S. Army pushed the

development of technologies that made possible a revolution in missile defense interceptors. These interceptors could destroy their targets by actually colliding with them. This eliminated the need for nuclear warheads and thus solved one of the major problems with the earlier Safeguard missile defense system.

31 Jul 79 Ronald Reagan, Republican presidential hopeful, visited the NORAD Command Post under Cheyenne Mountain near Colorado Springs. Here, Reagan saw a demonstration of the command and control facilities the U.S. would use to alert U.S. retaliatory forces and the American people in case of nuclear war. He was upset to learn that there was nothing the U.S. could do to defend itself against missile attacks. Shortly after this, he decided to make missile defenses a part of his national security policy if he were elected president.

8 Jan 82 A group of private advisors headed by Mr. Karl R. Bendetsen briefed President Reagan in the Oval Office, recommending that he launch an emergency national program to develop missile defenses. This effort should be patterned after the Manhattan District Project that produced America's atomic bomb during World War II.

11 Feb 83 After months of considering the strategic issues raised by America's inability to field the MX missile as a response to the growing ability of the Soviets to deliver an effective first strike against U.S. ICBMs, the Joint Chiefs unanimously recommended to President Reagan that the U.S. begin to pursue a national security strategy that would place increased emphasis on strategic defenses.

23 Mar 83 President Ronald Reagan announced his decision to launch a major new R&D program to see if it might be feasible to deploy effective missile defenses at some point in the future.

25 Mar 83 The policy announced in the 23 March speech was formalized in National Security Decision Directive 85.

18 Apr 83 President Reagan issued guidance calling for the completion of a two-part study. One study would assess the state of missile defense technology and recommend a technology program for the new missile defense program. The second part would assess the strategic and policy implications of such a program. The first study became known as the Defensive Technologies Study or the Fletcher Report, and the second study became known as the Future Security Strategy Study (sometimes called the Hoffman Report).

Oct 83 The Future Security Strategy Study (FSSS) was completed. This study consists of a series of papers that were completed by two groups: an interagency group headed by Mr. Franklin C. Miller, assistant secretary of defense for strategic forces policy, and a group of contractor personnel headed by Mr. Fred S. Hoffman of Pan Heuristics Corporation. Mr. Miller served as the overall study director. Among the major findings of these two groups were the idea that missile defenses could enhance deterrence (Miller group) and the view that an anti-tactical ballistic missile system could serve as useful first step toward a national missile defense system (Hoffman group).

Oct 83 The first version of the Defensive Technologies Study or Fletcher Report was completed. The final version did not appear until February 1984. This report outlined two models for the new missile defense research program ordered by the President. The favored program was to be technology constrained and called for a funding level of $1.405 billion in 1984, $2.385 billion in 1985, $3.43 billion in 1986, $4.284 billion in 1987, $4.623 billion

in 1988, and $4.766 in 1989. The alternative program was funded at a lower level and referred to as the fiscally constrained program. The recommended program was to consist of five basic research areas: Systems; Surveillance, Acquisition, Tracking, and Kill Assessment; Directed Energy Weapons; Kinetic Energy Weapons; and Supporting Technologies (Survivability, Lethality, Space Power, Space Logistics; Communications, Computers, and Software). The technology constrained program became the guide for the Strategic Defense Initiative.

Comments in the Fletcher report adumbrated both limited missile defenses and theater missile defenses. Specifically, the report recognized the commonality between the terminal phase of a strategic missile defense system and more limited defensive systems.

6 Jan 84 Presidential National Security Decision Directive 119 established the Strategic Defense Initiative (SDI) to explore the possibility of developing missile defenses as an alternative means of deterring nuclear war. SDI was to be "a focused program to demonstrate the technical feasibility of enhancing deterrence and thereby reducing the risk of nuclear war through a greater reliance on defensive strategic capabilities." The technology plan developed by the Fletcher committee was to be "the general guide for initiating this program." This directive also made the Secretary of Defense responsible for the new program. While the emphasis in the program was to be on non-nuclear developments, research work on defensive nuclear devices was to continue as a hedge against Soviet work in the same area. Finally, the SDI program was to "protect the option of near-term deployment of a limited BMD capability (non-nuclear if possible) as one possible interim response to Soviet BMD breakout."

27 Mar 84 Secretary of Defense Caspar Weinberger appointed Lt. Gen. James A. Abrahamson, U.S. Air Force, as first Director, Strategic Defense Initiative Organization (SDIO).

24 Apr 84 Secretary Weinberger signed the first charter for SDIO. This charter was specifically designed to be general in nature to give the organization's first director extensive leeway in managing the program. The charter also specified that the Director, SDIO, would report directly to the Secretary of Defense.

10 Jun 84 The core of the Army's new hit-to-kill interceptor technology was successfully demonstrated in the homing overlay experiment. In this demonstration, a test intercept vehicle was launched from Kwajalein Missile Range aboard a modified Minuteman rocket. Also riding on the Minuteman was an infra-red sensor package and an on-board computer. The interceptor itself carried a computer and an infra-red sensor package for guidance; it was also equipped with a kill device that resembled the folded skeleton of an umbrella with weights attached to its ribs. Once above the atmosphere, the sensor and computer in the Minuteman located and tracked a re-entry vehicle that had been launched from Vandenberg AFB by a second Minuteman missile. Then, the on-board computer of the launch rocket passed tracking data to the computer on the intercept vehicle. At the appropriate time, the interceptor package was launched and homed in on the target using its own infra-red sensor and on-board computer. Once free of the mother ship, the kill vehicle deployed its umbrella structure, crashed into the target vehicle, and destroyed it. This successful intercept followed partial successes in two other test flights.

Apr-Nov 85 The debate over the broad versus the narrow interpretation of the ABM Treaty began. One critical event in this early phase of the debate was a 6

October appearance on "Meet the Press" by National Security Adviser Robert McFarlane in which he indicated that the Reagan administration would be following the broad interpretation of the Treaty. Nevertheless, the administration continued to follow the narrow interpretation.

6 Sep 85 The Mid-Infrared Advanced Chemical Laser destroyed a Titan booster rigged to simulate the conditions of a thrusting rocket booster.

Dec 85 The Inter-National Research Institute completed a study of the SDIO organization and manpower situation. The study, which was commissioned by General Abrahamson in August 1985, was directed by Brigadier General Al Esposito, USAF (Ret). The Esposito study found that SDIO was "critically short of the people and skills required to carry out the responsibilities" in its charter. To overcome these difficulties, SDIO should reorganize and establish a Federally Funded Research Center to support the organization. The recommended organization included "two key line positions, the Deputy for Programs and Systems and the Deputy for Technology."

Dec 85 The SDIO Panel on Computing in Support of Battle Management submitted its report (the Eastport Study). The panel had been appointed

> *"'to devise an appropriate computational/communication response to the SDI battle management computing problem and make recommendations for a research and technology development program to implement the response.'"*

The report concluded that "computing resources and battle management software for a strategic defense system are within the capabilities of the hardware and software technologies that could be developed within the next several years." But this was a difficult task that constituted "the paramount strategic defense problem." The report noted that the "tradeoffs necessary to make the software task tractable are in the system architecture." The study stated that a "promising class of system architectures" was one that was "less dependent on tight coordination," for such an approach to the overall architecture offered "robustness, simplicity, and the ability to infer the performance of full-scale deployment by evaluating the performance of small parts of the system." The report also recommended the establishment of a non-centralized National Test Bed to provide the simulation support that would be necessary to solve the problems of battle management.

30 Jul 86 General Abrahamson directed that SDIO be reorganized. The new organizational structure featured two principal deputies: Brigadier General Malcolm O'Neill became the Deputy for Programs and Systems, and Dr. Lou Marquet became the Deputy for Technology. The reorganization was based upon the Esposito Study of SDIO's organizational requirements (see Dec 85 entry above). This change in SDIO's organization signalled the rising importance being assigned to system/architectural designs and was an indication that SDIO was resolving some of the technical issues it faced when the program began.

Aug 86 SDIO and the military services signed a charter establishing the National Test Bed, which was to operate under the overall guidance of SDIO, which funded the project. The charter provided for the establishment of an NTB Joint Program Office IPO) under executive direction of the Air Force. Through the JPO, the services were responsible for executing the NTB program.

11 Sep 86 SDIO completed the Delta 180 experiment. During this experiment, SDIO completed what was the first equivalent of a boost phase intercept of a target. Additionally, this experiment involved a number of sophisticated sensor experiments, including the collection of data from space on a booster vehicle launched from the White Sands Missile Test Range in New Mexico.

11-12 Oct 86 U.S. President Ronald Reagan and U.S.S.R. President Mikhail Gorbachev held their second summit meeting at Reykjavik, Iceland. During this meeting, Gorbachev pressed Reagan heavily to accept limitations on the SDI program as a pre-condition for other agreements restricting offensive arms. Reagan refused to accept Gorbachev's proposed restrictions on SDI.

Nov 86 The germination of the concept for Brilliant Pebbles occurred in discussions between Lowell Wood and Greg Canavan. There were antecedents of this interceptor concept in the interceptor program carried out by the U.S. Army in the seventies and early eighties, but it was Wood specifically who became the leading champion of "brilliant" technologies as the answer to problems posed by the costliness and vulnerability of space-based missile defense systems. "Brilliant" technologies refers to the use of powerful, miniaturized computers and miniaturized sensors to give the capabilities previously possessed only by large, expensive satellites to much smaller, inexpensive satellites.

4 Dec 86 While attending a meeting of NATO's defense ministers in Brussels, Secretary of Defense Caspar Weinberger announced the award of seven SDI contracts for the first phase of a theater missile defense architectural study competition. Contracts of $2 million were awarded to each of seven European and American prime contractor teams which were to complete their work by July 1987. They would then compete for further contracts based on the results of their phase one studies.

May 87 The SDIO staff moved into new facilities that had been constructed for it under the Pentagon concourse where the old bus tunnels used to be. Prior to this time, the bulk of the staff was housed in the Matomic Building in downtown Washington D.C.

11 May 87 Judge Abraham D. Sofaer, State Department Legal Advisor, completed his study of how the ABM Treaty affected the SDI program. The report was released on 13 May. Briefly, Sofaer concluded that the Treaty did not preclude testing of space-based missile defense systems, including directed energy weapons.

Jun/Jul 87 The Defense Acquisition Board of the Office of the Secretary of Defense conducted its first review of the SDI program. A second review was held in September. As a result, the Phase I baseline architecture was approved and six specific components of the SDI program were authorized to enter the demonstration and validation stage of the acquisition process.

29 Jul 87 The SDI Organization and the Army's Strategic Defense Command announced the selection of five phase I contractor teams which were to be invited to participate in the second phase of the SDI Theater Missile Defense Architecture Study. Contracts were expected to be completed in September with each team having until July 1988 to refine its architectural concept. The value of each contract was to very from $4.5 million to $7 million depending upon the exercise of contract options.

Nov 87 Lowell Wood briefed General James Abrahamson on the interceptor concept that eventually became Brilliant Pebbles.

4 Nov 87 A Patriot with the PAC-2 modifications successfully destroyed another Patriot missile that was simulating the flight of an SS-23 missile.

19 Jan 88 Senator Sam Nunn (D-GA) delivered a speech to the Arms Control Association calling for a reorientation of the SDI program. Nunn called for the new SDI program to focus first on developing a "limited system for protecting against accidental and unauthorized missile launches." A longer range goal of the program would be to develop a more comprehensive defensive system.

Spring 88 The National Test Facility (NTF) was activated in temporary facilities at Falcon Air Force Base near Colorado Springs. On 23 March 1988, the ground was broken to begin construction of the permanent research building for the NTF, which was also to be located at Falcon Air Force Base. Eighteen months after the ground breaking, the building was completed.

30 Sep 88 The SDI Organization was realigned. Among the major changes was the addition of several new positions. A chief of staff was added to oversee the activities of the SDIO staff. The addition of a chief engineer ensured the many engineering tasks and analysis efforts would receive the top-level management attention they required. Another major change was the creation of the Resource Management Directorate by merging the Comptroller and Support Services Directorates, a move designed to increase management efficiency. In another part of the change, the Programs and Systems Deputate was redesignated the Systems Deputate. Within this last office, a major goal of the reorganization was to achieve better integration and management of the six SDS Phase I elements by placing them under the Phase I program office within the Systems Deputate. A further change involved giving the Architectures and Analysis Directorate, which was formerly the Follow-On Phase Architectures Directorate, additional strength so that it could better address "alternative and innovative architectures."

1 Feb 89 Lt. Gen. George L. Monahan, Jr., became the second director of the Strategic Defense Initiative Organization, succeeding General Abrahamson who retired at the end of January.

9 Feb 89 General Abrahamson's end of tour report contained a strong recommendation of the Brilliant Pebbles concept. Abrahamson stated that an entire space-based architecture based on Brilliant Pebbles could be deployed in five years for a cost of no more than $25 billion.

3 Mar 89 President George H. W. Bush ordered a general review of U.S. national defense strategy.

14 Jun 89 Based upon his administration's review of U.S. security requirements, President Bush concluded that the goals of the SDI program were generally sound and that the program should continue in such a way as to offer the possibility of a deployment decision in the next few years. Emphasis in this effort was to be directed toward perfecting boost-phase kill technologies such as Brilliant Pebbles. In support of these directions, Bush directed DOD to carry out an independent review of the SDI program and to have this review finished in the fall of 1989.

Summer 89 Four major studies of the Brilliant Pebbles concept were carried out, including a review by the JASONs. The general conclusion of these studies was that Brilliant Pebbles was a promising, technically feasible concept that could provide the solution to cost and vulnerability problems of the space-based elements of the Phase I Strategic Defense

System architecture.

Dec 89 At the request of Secretary of Defense Richard Cheney, Ambassador Henry F. Cooper agreed to carry out the independent review of the SDI program that President Bush had called for as a result of his administration's review of national security requirements.

15 Mar 90 Ambassador Henry F. Cooper submitted the report of his independent survey of the SDI program. Here, Cooper endorsed the concept of Brilliant Pebbles and spelled out the concept that became the system for Global Protection Against Limited Strikes (GPALS).

30 Jun 90 Lt. Gen. George L. Monahan, Jr., retired from the Air Force.

10 Jul 90 President George Bush appointed Ambassador Henry F. Cooper to the position of Director, Strategic Defense Initiative Organization.

2 Aug 90 Iraq invaded Kuwait.

24 Oct 90 The FY 1991 Appropriations Conference Committee Report, H. Rep. 101-938 called for the Secretary of Defense to establish a centrally managed Theater Missile Defense (TMD) program funded at $218.249 million for FY 1991. The conference committee report also required the Defense Department to accelerate R&D on theater and tactical ballistic missile defense systems. While Congress recognized that it was too early to determine the baseline for a tactical ballistic missile defense (TMD) system, it asked the Secretary of Defense to submit a plan by 1 March 1991 for determining a TMD baseline system and then developing and fielding this system. Once determined, this plan was to be funded fully in DOD's Six Year Defense Program (1992-1997). Furthermore, the plan was to take account of Air Force and Navy requirements and include participation of these services.

9 Nov 90 The Under Secretary of Defense for Acquisition assigned to SDIO the responsibility for the Defense Department's centrally managed Theater Missile Defense program.

17 Jan 91 U.S.-led coalition forces in the Middle East began military operations against Iraqi forces.

18 Jan 91 According to press reports, for the first time in history, an anti-missile missile intercepted and destroyed a ballistic missile under combat conditions. A Patriot air defense missile destroyed an Iraqi Scud missile that was attacking a U.S. air base in Saudi Arabia. The crew that fired the Patriot missile was led by First Lieutenant Charles McMurtrey of Montgomery, Alabama. The Patriot was launched against the Scud at 4:28 a.m. local time. A reporter for the Los Angeles Times wrote: "The age of 'Star Wars' had arrived."

After the end of the Gulf War, questions were raised about whether or not this first "kill" actually occurred. This was part of a general public debate about the operational effectiveness of the Patriot system that began soon after hostilities ended and continued for about two years.

29 Jan 91 In his State of the Union Address, President Bush formally announced the shift in focus in the SDI program to the concept known as Global Protection Against Limited Strikes. The president stated:

> "I have directed that the Strategic Defense Initiative program be refocused on providing protection from limited ballistic missile strikes, whatever their source. Let us pursue an SDI program that can deal with any future threat to the United States, to our forces overseas and to our friends and allies."

25 Feb 91 A Scud missile struck a barracks

housing Army reservists, killing 28 soldiers. Later, a monument was constructed at the entrance to the headquarters of the 14th Quartermaster Detachment at Greensburg, Pennsylvania, in honor of 13 of the 28 people killed.

30 Mar 91 The Defense Department dispatched the Theater Missile Defense Report to Congress. This report was submitted in response to directions contained in the FY 1991 Appropriations Conference Committee Report (see 24 Oct 90 entry above). This report informed Congress that the SDIO would be the centralized management office for the theater and tactical missile defense programs and advised that SDIO would establish a "managerial position as Deputy for TMD, equal in status to the Deputies for technology and strategic programs." This new office was established as part the reorganization announced on 15 March by SDIO Director Ambassador Henry Cooper.

23 Apr 91 General Donald Kutyna, USAF, commander of the U.S. Space Command, told the Senate Armed Services Committee that U.S. control of space enhanced the effectiveness of coalition forces during the Persian Gulf War. The U.S. must plan in the future on having the means to control space by attacking the space assets of a possible enemy. The general also pointed out that General Norman Schwarzkof, commander of the coalition's forces, was able to move his troops without the movements being detected by the Iraqis because of our control of air and the fact that Iraq had no space reconnaissance assets.

28 Apr-
6 May 91 At 7:33 AM EST on 28 April, the space shuttle Discovery blasted off from Cape Canaveral with several major SDIO experiments aboard. The launch, originally scheduled for 26 February, had been delayed because of a number of difficulties with the space shuttle. One of the more interesting facets of the experiments carried out on this mission was the shuttle's execution of a maneuver known as the "Malarkey Milkshake." This maneuver was part of an experiment that observed the firing of the shuttle's engines against various backgrounds, e.g., against the earth, against black space, against the earth's limb, etc. Planners for this experiment had expected to get a minimum of six views of the shuttle's engines firing and hoped for as many as twelve; they actually observed the firing engines seventeen times. The shuttle mission ended at 2:56 p.m. EDT on 6 May when the Discovery landed at Cape Canaveral.

5 Dec 91 President George Bush signed into law H.R. 2100, the "National Defense Authorization Act for Fiscal Years 1992 and 1993." That portion of H.R. 2100 dealing with missile defenses was known as the Missile Defense Act of 1991. This act required the Defense Department to "aggressively pursue the development of advanced theater missile defense systems, with the objective of down selecting and deploying such systems by the mid-1990s." Additionally, DOD was to "develop for deployment by the earliest date allowed by the availability of appropriate technology or by fiscal year 1996 a cost effective, operationally effective, and ABM Treaty-compliant antiballistic missile system at a single site as the initial step toward deployment of an antiballistic missile system." This system was to be "designed to protect the United States against limited ballistic missile threats, including accidental or unauthorized launches or Third World attacks."

1 May 92 Ambassador Henry Cooper concluded a memorandum of agreement with the secretaries of the military services that established the organizational structures and procedures for handling the acquisition of the GPALS system as DOD moved ahead with

deploying missile defenses in accordance with instructions contained in the Missile Defense Act of 1991. Among the more important provisions of this MOA were that SDIO would establish a General Manager's function, headed by a three-star general, that would be responsible for working with the military services in the management of procurement actions. The General Manager would work through GPALS program executive officers (PEO) that each military service would appoint. The PEOs were to be of flag rank. Each PEO was to have authority over all program managers within his or her service who were completing SDI work in accordance with program management agreements worked out between SDIO and the military services.

2 Jul 92 Secretary of Defense Richard Cheney dispatched to Congress the 180-Day Report required by the National Defense Authorization Act for Fiscal Years 1992 and 1993. This report outlined the Defense Department's acquisition strategy in support of the deployment goals set by the Missile Defense Act of 1991. This strategy would allow the U.S. to deploy a user operational evaluation system (UOES) to provide limited protection of the U.S. by 1997. Where theater missile defenses were concerned, the basic strategy was to up-grade existing defensive capabilities such as those possessed by the Patriot and then to produce an advanced, new generation system with greater range and effectiveness. The advanced system was to be the Theater High Altitude Area Defense (THAAD), which was to have a contingency capability as early as 1996.

1 Oct 92 House and Senate Conferees agreed to the provisions that were to be included in the National Defense Authorization Act for Fiscal Year 1993. This law amended the Missile Defense Act of 1991 by placing more emphasis on treaty compliance in any National Missile Defense the U.S. might choose to deploy and by eliminating the target date of 1996 for deployment of the initial NMD site. Finally, the requirement to deploy advanced theater missile defenses by the mid-1990s was eliminated and replaced with a requirement to develop advanced theater missile defense systems for deployment.

Dec 92 Program management responsibility for Brilliant Pebbles was transferred to the Air Force. All changes associated with the transition were to be completed by 30 September 1993.

10 Dec 92 SDIO, U.S. Space Command, and the U.S. Air Force signed a memorandum of agreement that started the process of transferring ownership of the National Test Facility to the Air Force, with the final transfer coming at a later time as agreed to by the three signatories to the agreement.

7 Jan 93 Ambassador Henry F. Cooper, director SDIO, submitted a letter of resignation to President George Bush, with the resignation to be effective 20 January.

20 Jan 93 William Jefferson Clinton was sworn in as the forty-second president of the United States.

13 May 93 Secretary of Defense Les Aspin announced that the Strategic Defense Initiative Organization was being redesignated the Ballistic Missile Defense Organization to reflect the new focus in DOD's missile defense program and the new way in which the program would be managed. The major change in management was that the organization would no longer report directly to the secretary of defense, but rather to the under secretary of defense for acquisition. Concerning the refocusing of the program, Secretary Aspin noted that the end of the Cold war meant that the U.S. no longer faced the threat of a

massive Soviet attack such as that the SDI program had concentrated on. Now, the U.S. faced theater ballistic missiles in the hands of Third World dictators; these missiles could pose a threat to our forces and to the forces and peoples of our allies. Additionally, in the future, the U.S. could "face hostile or irrational states that have both nuclear warheads and ballistic missile technology that could reach the United States. . . . That's why we've made theater ballistic missile defense our first priority to cope with the new dangers of the post-Cold War era." The next priority was developing defenses for the American people.

4 Aug 93 Secretary of Defense Les Aspin announced that President Clinton has nominated Major General Malcolm O'Neill, BMDO Acting Director, for the position of BMDO Director with promotion to lieutenant general. General O'Neill's appointment had to be approved by the Senate.

1 Sep 93 Secretary of Defense Les Aspin announced the results of the Bottom-Up Review which laid out America's national security plans for the five year period between FY95 to FY99. Where the ballistic missile defense program was concerned, primary emphasis was to be placed on Theater Missile Defense, which was to receive $12 billion. National Missile Defense was to receive $3 billion, with the remaining $3 billion split between Follow-On Technology and Research and Support.

19 Nov 93 The U.S. Senate confirmed Major General Malcolm R. O'Neill for the position of Director, Ballistic Missile Defense Organization, and approved his promotion to lieutenant general. O'Neill was promoted on 22 November during a ceremony in the offices of BMDO.

30 Nov 93 The Army carried out a successful test of the Extended Range Interceptor (ERINT) at the White Sands Missile Range in New Mexico. The ERINT collided with the warhead of a STORM target vehicle. This warhead contained a cluster of 38 pressurized, water-filled containers designed to simulate toxic chemical submunitions.

11 Feb 94 The Army System Acquisition Review Council selected the Extended Range Interceptor (ERINT) over the Patriot multi-mode missile to be the missile in the PAC-3 theater missile defense program.

15 Feb 94 An Extended Range Interceptor (ERINT) hit a ballistic missile target vehicle in a test conducted at the White Sands Missile Range in New Mexico. The target was a nose cone carrying a simulated chemical warhead.

11 May 94 A Scud missile struck the North Yemen city of Sanaa at 1 a.m. today causing fifty-three casualties. As many as twenty-five of these people may have died.